during the past year is a real help to the astronomical investigator, and saves him much time and labour. In spite of the mass of material that is embodied in the work, the volume is, according to pages, only a trifle larger than its immediate predecessor, and somewhat smaller than vol. iii. As a matter of interest, it may be stated that the number of references in the present and the two preceding volumes are 2582 for vol. v., 2411 for vol. iv., and 2513 for vol. iii.

In conclusion, the statement made with regard to the earlier volumes, namely, that they should be found in every astronomical library and observatory, may be repeated in the present case. W. J. S. L.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.]*

The Forest-pig of Central Africa.

I HAVE seen Mr. Oldfield Thomas's interesting letter in your issue of October 13 relative to the remarkable forest-pig (which he has named *Hylochoerus meinertzhageni*). With regard to the discovery of this remarkable beast, there are perhaps other names which should be associated with it as well as those of the late Sir Henry M. Stanley and myself. No mention of this forest-pig appears in Sir Henry Stanley's published works, but in conversation with myself and others he frequently told us that, in addition to hearing of a "donkey-like animal with large ears" (which afterwards turned out to be the okapi), he once saw a huge black pig, and he had reason to believe that a strange new species or genus of pig inhabited that portion of the Congo Forest near the Semliki River. I heard and transmitted similar stories told me by the natives of that forest; but even more detailed accounts were collected and sent later on by the late W. G. Doggett, who, to the great loss of zoological collecting in Africa, was drowned in the River Kagera in the early part of the present year. But I think the first definite accounts of this pig (or at any rate of *Hylochoerus meinertzhageni*) were transmitted by Mr. C. W. Hobley, C.M.G., a sub-commissioner of the East Africa Protectorate, who has recently been acting as Commissioner after the departure of Sir Charles Eliot. Mr. Hobley sent a drawing of the skull and a description of the creature from imperfect specimens he had seen on the slopes of Mount Kenia. Unfortunately his letters were delayed in transmission, so far as their reaching the Zoological Society was concerned. Mr. Hobley is now in England, and it is to be hoped that he will furnish the Zoological Society in detail with the extremely interesting particulars he has given me in conversation regarding this remarkable animal. I would remind your readers that Mr. Hobley (who as regards length of service is almost the senior British official connected with British East Africa) made the important discovery last year of marine organisms in the Victoria Nyanza.

So far, the native stories of the okapi and the big forest-pig have turned out to be true. It only remains to complete the trilogy by the discovery of a third mysterious animal, also alluded to in conversation, if not in writing, by Stanley, and mentioned by Doggett and myself. This, so far as native accounts can be crystallised into a definition, would seem to be some large tragelaphine antelope resembling the nilghai in appearance, with short, twisted horns. A horn or a pair of horns attributed to this animal was, I believe, brought home by a member of Stanley's expedition, and is possibly in the British Museum. It was seen by Dr. P. L. Sclater, and attributed by him to an abnormally developed cow eland; but so far as I could learn from my own researches and those of Doggett, the natives of the Semliki Forest were careful to differentiate this creature from either the forest eland or the bongo. Their accounts of it certainly coincide to a great extent with their stories of the okapi, though they insisted on the difference between the two animals. Perhaps there is as much truth in their stories of this large antelope with small twisted horns as there has been shown to be in connection with the okapi and the forest-pig. H. H. JOHNSTON.

Mendel's Law: a Crucial Experiment.

I SEE from the published account of a recent discussion at the Cambridge meeting of the British Association that the facts of Mendelian segregation are still disputed by the biometric school of evolutionists. I venture, therefore, to submit to your readers the result of an experiment carried out at the Royal Botanic Gardens, Peradeniya, which, in my opinion, proves conclusively that in a particular cross-bred form a particular pair of characters did become segregated in equal numbers of germ cells, both male and female. The characters in question were:—the appearance and absence respectively of a yellow coloration in the endosperm of grains of Indian corn (*Zea Mays*). These characters are discontinuous in the strain examined. Among about 100,000 grains which passed under my notice, I saw only two which were partly yellow and partly white; these were counted as yellow, being presumably heterozygotes.

Some of my specimens were exhibited by Mr. Bateson at the recent meeting of the British Association, but I can now add the results of a further generation.

The facts are represented in the following scheme, in which the absence of the yellow pigment is expressed by the term "white."

I. {(1) White flint corn; extracted recessive from a mongrel strain} ♀ × ♂ {(2) Yellow flint corn; of the same mongrel strain as (1)}

II. {(3) Yellow grains} ♀ × ♂ {(4) Offspring of (1); self-pollinated white}

III. (5) 1963 yellow (49·76 per cent.) + (6) 1982 white.

The plants arising from these grains, both white and yellow, were used as seed parents in the next generation, the pollen parent being "Boone County White" dent corn. There resulted:—(*a*) Offspring of white grains—some 30,000 white grains and 27 yellow grains (0·09 per cent.); the latter were accounted for by the escape of "yellow" pollen. (*b*) Offspring of yellow grains—generation iv.:—

IV. 26,792 yellow (50·03 per cent.) + 26,751 white.

(Self-pollinated)

V. 16,582 yellow + 5681 white (25·5 per cent.)

The plants arising from the above yellow grains (generation iv.) were also used as pollen parents for a cross in which the seed parents were the offspring of "Boone County White" crossed with a strain of extracted recessives from the original mongrel flint corn. There resulted:—

2507 yellow (49·2 per cent.) + 2593 white.

I would direct particular attention to the following points:—

(1) That a perfect Mendelian result was obtained among the offspring of an impure race.

(2) Lest it should be objected that possibly the ancestry of this mongrel strain included equal numbers of yellow and white individuals, a pure recessive strain ("Boone County White," imported from U.S.A.) was introduced into the pedigree, so that the next generation (iv.) possessed at least three times as many white ancestors as yellow. On self-pollinating the offspring of yellow grains, the Mendelian proportion 3 yellow to 1 white was obtained.

(3) In two generations the female germ cells borne upon the heterozygotes were tested by crossing with the recessive form. In each case half of the germ cells were found to

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bear the yellow character and half of them the white. In the last generation a similar test was applied to the male germ cells with the same result.

(4) The experiments were carried out under fully "biometric" conditions, the more accurate "Mendelian" method of careful pollination between individual plants being deliberately avoided. Thus, in generation iv. pollination was effected by the aid of the wind from some 1800 recessive parents indiscriminately.

A somewhat fuller description of the early part of this experiment has already appeared in vol. ii., part ii., of the *Annals* of the Royal Botanic Gardens, Peradeniya, and a complete account will be published in a future number of the same journal. R. H. LOCK.

Peradeniya, Ceylon, September 21.

Rock Pressure at Great Depths.

IN his address to the engineering section of the British Association, Mr. Parsons speaks of sinking a shaft into the earth for a distance of 12 miles.

I think, however, he overlooks a factor which sets a limit to the depth to which a mine shaft can be sunk. If we assume that the average specific gravity of the earth's crust is 3, the superlaying rocks would exert at a distance of 12 miles a pressure of about 440 tons per square inch.

There can be little doubt that when subjected to such a pressure the rock material would give way and flow together like a viscous fluid, and so the walls of the shaft would spontaneously close up, probably before the depth of 12 miles was reached. The breaking stress of steel is only 44 tons per square inch, and so, even were the walls encased by a steel tube, this would not avail to prevent the flowing together of the walls. GEOFFREY MARTIN.

Kiel, Preusser-str. 19I, September 17.

I HAVE to thank you for directing my attention to Mr. Martin's letter in which he gives his views as to the probable behaviour of rock around a very deep shaft boring, and his opinion that the inward viscous flow of the rock would place a limit to the possible depth.

I have to thank Mr. Martin for directing attention to the question of this possible limitation, which was considered when writing my address and dismissed as unlikely to occur up to depths of 12 miles, basing my conclusion on general engineering knowledge of the flow of metals, of the relative impressions made on hard brass and on hard rock when struck by hard steel tools, and on the general behaviour of metal when forged.

I must first beg leave to point out some errors in Mr. Martin's figures; he has misplaced the decimal point in calculating the hydraulic pressure of the superlaying rocks at 12 miles depth, which should be 40 tons and not 440 tons per square inch.

Again, of the crushing stress required to make hardened steel flow I have no data by me, but am aware that it lies between 120 tons and 300 tons per square inch, and in the case of hardened knife edges for weigh bridges, if my memory is correct, the pressure per square inch on the area of contact reaches a still higher figure.

Again, the pressure required to make the tough brass ("cartridge metal") flow is about 80 tons per square inch.

I think that the evidence at present available leads to the conclusion that after a small amount of shrinkage of the shaft sides inwards has taken place a state of equilibrium would be established enabling the surrounding rock in its state of great compression to withstand the so-called hydraulic pressure due to a depth from the surface of at least 12 miles.

Since my address I have had the opportunity of discussing the matter with Prof. G. H. Darwin, who has kindly brought to my notice the article by Tresca, "Memoirs des Savants étrangers sur l'écoulement des Corps solides," about the year 1866, and also his own paper in the *Philosophical Transactions* of the Royal Society, part i., 1882, in which the great shearing stresses that are thrown on the earth's structure by the weight of mountain ranges on elevated continents and great depths of the sea are exhaustively treated. I would only point out that such stresses have been endured for long epochs, and that in view of the established fact that rocks are viscous, it is clear that much greater stresses could be sustained for the comparatively short time necessary to complete a deep shaft boring.

It would, however, be interesting to subject a cylinder of granite or quartz rock, carefully fitted into a steel mould and having a small hole bored through its centre, to a pressure of, say, 100 tons per square inch, and see what shrinkage in the hole would result, or a hole might be bored into the specimen through an aperture in the mould while subjected to this pressure. This pressure would correspond to a depth of about 38 miles.

CHARLES A. PARSONS.

Holeyn Hall, Wylam-on-Tyne, October 7.

The Berlin "Thinking" Horse.

IN your issue of September 22 there is a paragraph among the notes (p. 510) with reference to "Clever Hans," a "thinking horse" at present displaying his powers in Berlin. With reference to it I wish to say that twelve or thirteen years ago there was on exhibition in the Royal Aquarium, London, a horse of, if I mistake not, exactly the same stamp. I happened to be then attending lectures at the Royal College of Science, and I went to see the animal. I had, moreover, a long conversation with his trainer, who eventually let me see exactly how it was all accomplished.

With all respect to the members of the "representative committee" at Berlin, I am driven to hold that the performances recorded, counting the number of the audience, picking out the tallest man present, telling the hour, &c., which seemed so deeply to impress them, partake of the nature of a stage trick. They demonstrate what training and perseverance can do with animals rather than the possession on their part of any advanced mental powers.

The Aquarium horse was named, if I remember aright, Mahomet. He could work sums in addition and subtraction, or, for that matter, in multiplication, could count the number present in the little side-show, could make a good guess at the age of an individual, and so on. He had been taught to begin pawing the ground when his trainer looked straight at him, and to cease when the trainer turned his gaze to the floor. It is easy to see the countless changes that can be rung on this accomplishment. Telling the time on a watch or the day of the month are readily recognised to be among them. Similarly, he had been drilled into bowing his head at one tone of his trainer's voice, and shaking it on hearing another. Again one can readily imagine how this bit of instruction will lend itself to a very varied and wonderful display of cleverness.

Mahomet's owner was an American and followed the business of training horses, especially circus ones. This horse, he discovered, was very easily taught—a genius among his kind—and on him he then lavished years of most careful labour, often, he assured me, sleeping of nights in the manger at his head. The results were as shown. They were in themselves sufficiently marvellous, and represent, I fancy, the very utmost that a horse can be trained to do. "Clever Hans" would seem to be blessed with a trainer as painstaking and persevering as my American friend.

After a *séance* which I had all to myself, Mahomet's owner delayed with me to see the performance of a clever dog on the central stage. The dog, a fair specimen of a rough collie, answered questions, spelt his own name, words sent up by the audience, &c. The letters of the alphabet were placed in order in a wire frame towards the back of the stage. The collie went along the letters, picked out the one he needed, and brought and laid it before the footlights. He then went for the next. Wonderful I thought the performance until my friend the horse-trainer showed me how it was done. The collie always began at A. He then trotted along up the alphabet until he reached the one he needed. His master carried his gloves in his hand. A little twitch of the gloves as the dog passed the particular letter wanted was the cue. The well trained animal took in the slightest stir of the gloves with the corner of his eye. This dog even played a game of cards—and won. A hundred and one variations might be made on the same trick.

I have read since in an American newspaper of a Tennessee

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